Landing Flap Guide for Aircraft

The invention pertains to a landing flap guide for aircraft, wherein a guide element is connected to a landing flap that is supported in a guide rail and can be adjusted between take-off position and landing position.

Landing flaps that carry out a proportional translatory movement are usually guided by a landing flap carriage that is guided on a landing flap carrier. The landing flap carriage needs to absorb all occurring forces that act thereupon in vertical and lateral direction relative to the roller race of the carriage.

This may require a relatively expensive construction with numerous guide rollers that have disadvantages essentially with respect to cost, maintenance and weight.

Consequently, it is an object of the invention to provide a landing flap guide for aircraft that allows for a simplified and statically safe landing flap guide and that is highly reliable.

This object is attained in that the guide element is realized in the form of a slide that can be adjusted in an essentially straight landing flap carrier as guide by means of at least one glide guide of the landing flap carrier.

It is believed that an advantage of this solution can be seen in the fact that the number of movable parts and consequently the number of parts subjected to wear is small. This design not only can be realized with a low weight, but is also cost-efficient with respect to its manufacture as well as its maintenance. Further, it is believed that depending on the forces to be considered, the number of additional guide rolls may be reduced. It may even be possible to obviate further guide rolls.

Advantageous additional embodiments are defined by the features of the dependent claims.

Embodiments of the inventions are schematically illustrated in the figures. The figures show:

Figure 1, a partial cross sectional view along AA' through the landing flap guide in Fig. 2,

Figure 2, a side view of a landing flap guide.

In the embodiment shown in Figs. 1 and 2, a landing flap 1 of a landing flap slide 4 is supported and guided in a landing flap carrier 3 on a wing. Fig. 1 is a schematic partial cross sectional view along AA' through the landing flap guide in Fig. 2

In order to extend and retract the landing flap 1, the landing flap 1 is connected to the glide slide 4 and is supported and guided in slideways 42, 44 of the landing flap carrier 3.

In this case, the slide 4 absorbs all forces acting thereupon in, with respect to the guide rail 3, perpendicular and lateral direction .

Figure 1 schematically shows a landing flap 1 that is connected to a landing flap slide 4 via a rotary joint 45, 46 that is only schematically indicated in the figure, wherein the axis of rotation of the rotary joint 45 lies in the drawing plane.

Gliding elements 41, 43 mounted on the landing flap slide 4 enable the slide 4 to move in slideways 42, 44 of the landing flap carrier 3. The slide 4 directs all forces from the landing flap 1, acting in perpendicular and lateral direction in relation to the slideway, via the glide pairing 41, 42; 43, 44. This means that each glide guide comprises gliding elements 41, 43 that are mounted on the slide, as well as slideways 42, 44 that are mounted on the flap carrier.

The gliding elements 41, 43 and the slideways 42 and 44 form a rail or track system which essentially allows a movement along the slideways only. Thus, according to an exemplary embodiment of the present invention, gliding elements 41, 43 and the slideways 42 and 44 form a rail or track system which allows a translatory movement with essentially only one degree of freedom.

In order to ensure a safe and reliable function of the gliding guide under all realistic environmental conditions, each glide pair must be able to withstand a high surface pressure and must have relatively low and permanent coefficients of static friction

and dynamic friction. In addition, each glide pair should be highly resistant to temperature fluctuations, humidity, frost, chemical agents etc. Further, also the wear should be as calculable as possible. Among others, the following materials may be chosen for the gliding surfaces of the glide pairs based on these requirements:

Coated or uncoated metals, ceramics, synthetic materials with embedded ceramics or metals, fiber-reinforced synthetic materials (e.g., CFRP-textile), fiber-reinforced ceramics (e.g., CFRP-textile with SiC), as well as carbon layers applied onto a substrate in a plasma, wherein their hardness can be adjusted between those of graphite and diamond with conventional methods.

According to an exemplary embodiment of the present invention, the gliding elements 41 and 43 which are in engagement with the slideways 41 and 44 may each have an essentially oblong or rectangular cross section. In other words, in Fig 1, the gliding elements 41 and 43 may extend into the plane of Fig. 1 with an essentially rectangular form. Preferably, the gliding elements 41 and 43 extend essentially parallel to the rails or slideways of the flap carrier 3.

As depicted in Fig. 1, the slideways 42 and 44 may have an essentially U-shaped cross section. Preferably the cross sectional form of the slideways 42 and 44 is adapted to the cross sectional from of the gliding elements. Thus, it may be possible to have differently shaped gliding elements 41 and 43 on both sides of the slide 4 interacting with respectively shaped slideways 42 and 44 to respond to different loads or spatial conditions in the wing.

Fig. 2 is a partial cross sectional view of the wing and shows a side view of the landing flap guide arrangement according to an exemplary embodiment of the present invention.

As may be taken from Fig. 2, the landing flap 1 is guided along rail 3 by means of a sled or sliding arrangement 4. The guidance of the flap 1 on the rail 3 by means of the sled allow a positioning, extending or retracting of the flap.

As already described with reference to Fig. 1, the slide 4 is guided in the rail 3 by means of gliding elements 42 and 43 which are in engagement with the slideways 41 and 44. However, as may be taken from Fig. 2, according to another exemplary embodiment of the present invention, further guiding elements may be provided. As depicted in Fig. 2, lateral guiding elements 52 and 54 may be provided which are adapted to avoid a movement of the slide 4 in a direction essentially laterally perpendicular to the rail 3. In other words, guiding elements 52 and 54, which may be guiding rolls interacting with the rail 3, may be provided to allow for a lateral guidance of the slide 4 on the rail 3. These guiding elements may be attached to the slide 4 by means of respective mounts 50. Furthermore, in another guiding element 56 such a guiding roll may be provided which rolls, in the view depicted in Fig. 2, on the rail 3. In addition to the gliding elements 41, 43 and the slideways 42, 44, this may allow to further restrict a movement of the slide 2 in a direction parallel to AA'. These guiding elements 52, 54 and 56 may even allow to further improve the guidance of the slide in the slideways 42 and 44 since tilting or twisting of the glide elements 41 and 43 in the slideways 42 and 44 may be avoided. This may allow for a smooth and secure guidance of the flap. Furthermore, the provision of the guiding elements 52, 54 and 56 in combination with the slideways 42 and 44 may allow for a secure and reliable flap guide system which may require a reduced amount of maintenance.